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## *A COMPARISON OF TWO NAVY WATCH SCHEDULES*

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## A COMPARISON OF TWO NAVY WATCH SCHEDULES

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## **EXECUTIVE SUMMARY**

### **Problem**

Around-the-clock work is common in both military and civilian work environments, but optimal schedules for providing such coverage have not been established. Performance and safety are of most concern during night work when individuals are at the low point of their endogenous circadian rhythms. Impaired sleep is a significant problem for night workers. Commutes home and social demands can combine with the circadian problems inherent in night work to prevent sufficient sleep. Individuals differ in their response to shift work. Age and morningness-eveningness characteristics may affect shift-work tolerance. Schedule satisfaction may relate to the duration of periods off work that the schedule provides

### **Objective**

The objective of this report is to compare two different work schedules for a Navy watch as to amount of sleep, perceived alertness, performance, safety, and job satisfaction.

### **Approach**

The approach taken was to utilize a natural experiment that came about when a watch that had been evaluated during a consultation was changed to a new schedule. Eight subjects participated in the first evaluation. Eight different subjects were included in the follow-up data collection. Data were collected using questionnaires and sleep logs.

### **Results**

The original schedule was a two-shift watch that provided 24-hr, 7-day coverage with only 4 watchstanders, while allowing each watchstander a three-day weekend off every other weekend. The basic rotation was: 2 nights (N), 2 days off (DO), 3 days (D), 2DO, 2N, 3DO, 2D, 2DO, 3N, 2DO, 2D, and so forth, alternating between nights and days every shift. The new schedule added a 5th watchstander. There were three 9-hr shifts on weekdays and two 13-hr shifts on weekends. The basic pattern of the schedule was 5D, 2DO, 5 evenings, 2DO, 7N (9 hr on weekdays, 13 hr on weekends), 5DO, 2D (13-hr shifts), 7DO, and then back to the beginning again. Watchstanders sometimes did not work the 2 weekend days, in which case they got a full 2 wk off. Overall, amounts of sleep obtained by workers on the two schedules were similar. There was a nonsignificant increase in subjects liking the second work schedule as compared to the first.

### **Conclusion**

Increasing the number of watchstanders from 4 to 5 and changing the weekday schedule to a 3-shift watch instead of a 2-shift watch had surprisingly little effect on the amount of sleep watchstanders got and improved schedule satisfaction minimally. There is some indication that the schedule change may have improved worker performance and safety, but most measures of fatigue remained unchanged. Thus, it appears that employers cannot assure that workers will get adequate sleep by providing them adequate time off to do so.

## INTRODUCTION

The requirement for around-the-clock coverage is common in both military and civilian work environments these days. The ideal way to provide such coverage is a matter of controversy. Experts have advocated rapidly rotating systems, slowly rotating systems, and permanently assigning individuals to specific shifts (Folkard, 1992; Monk, 1986, 1990; Wedderburn, 1992; Wilkinson, 1992). In general, delaying rotations (moving from mornings, to evenings, to nights) have been found preferable to advancing rotations (Barton and Folkard, 1993; Czeisler, Moore-Ede, & Coleman, 1982).

Night work causes most of the problems in shift work. Night work requires individuals to work at the low point of their endogenous circadian rhythms (Monk, 1990). Because of the circadian effects of sunlight and the fact that many night workers revert to a day schedule on days off, night workers rarely if ever truly synchronize their circadian rhythms with their work schedule (Monk, 1986; Tepas and Mahan, 1989). Impaired sleep is a significant problem for night workers (Åkerstedt & Gillberg, 1981; Walsh, Tepas, & Moss, 1981). Night shifts lasting 12 or more hours have rarely been advocated except in situations where personnel sleep at the job site between shifts (Duchon, Keran, & Smith, 1994). Commutes home and social demands can combine with the circadian problems inherent in night work to prevent sufficient sleep (Comperatore, Chiaramonte, Pearson, & Stone, 1993).

Different individuals react differently to shift work. Increasing age tends to decrease shift-work tolerance, at least among men (Härmä, Hakola, & Laitinen, 1993; Ogińska, Pokoroski, Ogińska, 1993). Morning types (sometimes called "larks") have been reported to be less tolerant to shift work than evening types ("owls") (Breithaupt, Hildebrandt, Döhre, Josche, Sieber, & Werner, 1978; Härmä, 1993; Motahashi, 1992). However, some data conflict with this theory (Folkard, Monk, & Lobban, 1979). Schedule satisfaction often has been reported to relate to the duration of periods off work that the schedule provides (Duchon, Keran, & Smith, 1994; Ng-A. Than & Theiry, 1993).

In the study reported here, watch standers working on a watch schedule that provided around the clock coverage, 7 days a week, using 4 watch standers per watch location were surveyed using sleep/work logs and with a questionnaire collecting information about job satisfaction, sleep, and perceived effects on alertness and performance. Subsequently, the work schedule was altered by increasing the watchstanders per site to 5, and switching from 12-hr shifts to predominantly 8-hr shifts. The opportunity to repeat the data collection on a second work schedule provided a natural experiment, allowing comparison of the effects of two schedules under real-world conditions.

## METHODS

### Subjects -

Eight subjects from two different watches, participated at the time of the original consult. Of these, one reported working two jobs (moonlighting), so his data were considered questionable and excluded. After the schedule change, data were collected from 8 additional subjects, none of whom had participated in the first data collection. One of this second group of subjects did the questionnaire but not the sleep log. Subject characteristics are summarized in Table 1. Schedule

Table 1: Subject Characteristics			
Subject #	Age	Civ/Mil	Gender
11	29	mil	male
12	33	mil	male
13	35	mil	male
14	39	civ	male
15	26	mil	male
16	27	civ	male
17	26	civ	male
21	41	mil	male
22	38	civ	male
23	36	mil	male
24	30	civ	male
25	28	civ	female
26	27	civ	female
27	27	civ	male
28	31	civ	male

1 subject numbers start with 1, schedule 2 with 2. Subjects in the two groups did not differ as to age, marital status, morningness/eveningness (all but one in each group were morning types), or commute time to and from work. Five subjects in each group were married. There were 2 females in the schedule 2 group, but none in the schedule 1 group.

#### Procedures -

A standard shiftwork questionnaire (University of Sheffield, England.) was adapted for the first data collection (Appendix A). This questionnaire had to be further adapted for the second work schedule, to allow for the 3 vs. 2-shift context (Appendix B). Both work-schedule evaluations included sleep logs filled out for at least a two-week period (Appendix C).

## RESULTS

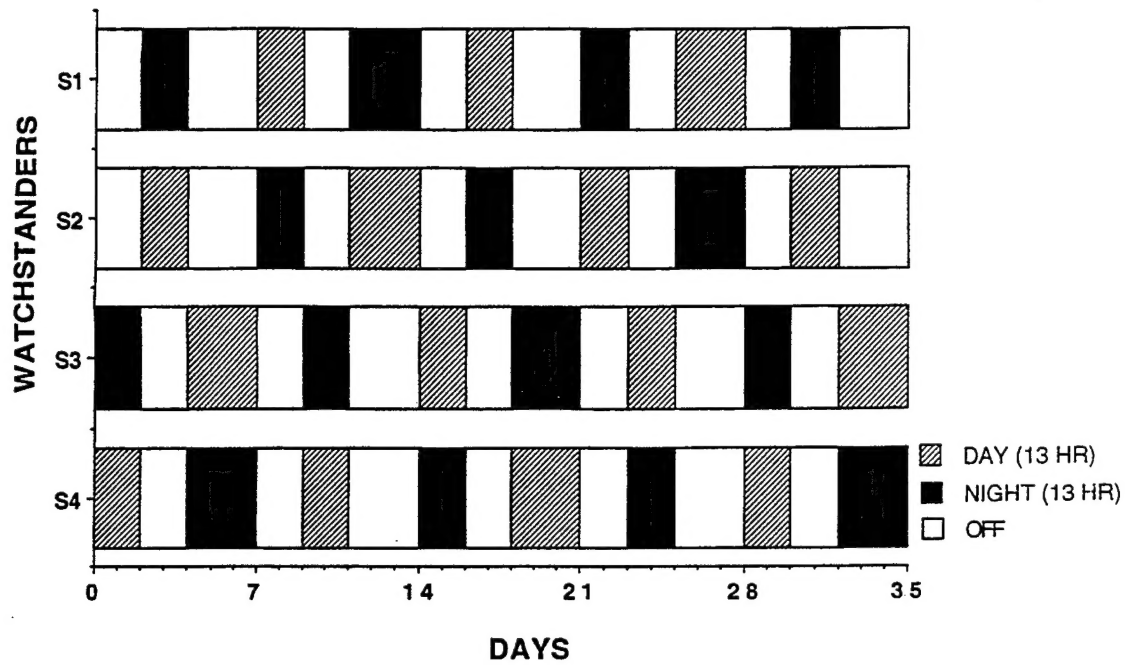
The original schedule was a two-shift watch that provided 24-hr, 7-day coverage with only 4 watchstanders, while allowing each watchstander a three-day weekend off every other weekend. The basic rotation was: 2 nights (N), 2 days off (DO), 3 days (D), 2DO, 2N, 3DO, 2D, 2DO, 3N, 2DO, 2D, and so forth, alternating between nights and days every shift. The schedule is diagrammed in Figure 1. The new schedule added a 5th watchstander. There were three 9-hr shifts on weekdays and two 13-hr shifts on weekends. The basic pattern of the schedule was 5D, 2DO, 5 evenings, 2DO, 7N (9 hr on weekdays, 13 hr on weekends), 5DO, 2D (13-hr shifts), 7DO, and then back to the beginning again. Watchstanders sometimes did not work the 2 weekend days, in which case they got a full 2 wk off. The second schedule is illustrated in Figure 2.

Selected questionnaire responses are summarized in Table 2. The initial schedule was not popular among the subjects. Three didn't like it at all, 4 liked it a little. Five of 7 were frequently or always tired on the night shift and 5 of 7 were at least sometimes so tired they felt it interfered with their work. Only 2 of 7 had sleepiness problems on the day shift. Problems sleeping when working the night shift contributed to the difficulties experienced. This may have been aggravated by the fact that most subjects appeared to be morning types. The commute home was of particular concern. Six of the seven watchstanders reported feeling unsafe driving home sometimes or often after working the night shift, and 4 sometimes felt unsafe driving home even after working a day shift.

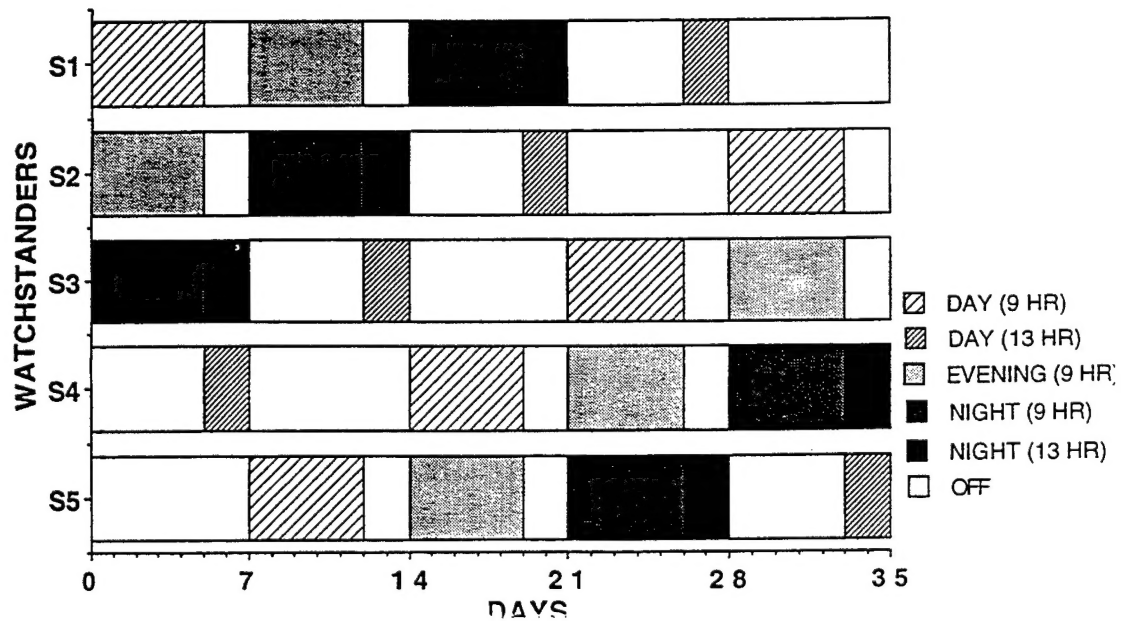
The second schedule seemed more popular with the subjects. Three liked it very much, 4 a little, and one marked his degree of liking as in between very much and a little. However, the difference between the schedules in degree of satisfaction was not significant, and there was no difference reported in the adequacy of sleep or most measures of fatigue. All 8 reported feeling unsafe driving home sometimes or often after working the night shift. The only significant fatigue-related differences between the questionnaire results from the two schedules were that subjects working the second schedule reported less frequently feeling so tired that it impaired their ability to perform their job and less frequently feeling unsafe driving home after a weekday day shift (both  $p < .05$ ).

Sleep/Work log data are summarized in Table 3. The sleep logs confirmed the indication from the questionnaires that the predominance of shorter work shifts in schedule 2 did not

**FIGURE 1: FIRST WORK SCHEDULE**



**FIGURE 2: SECOND WORK SCHEDULE**



increase amount of sleep between periods on watch. Amounts of sleep on the 9-hr schedule were similar to those working 13-hr shifts. Use of naps following work shifts was somewhat more frequent on schedule 2. While naps on off days were more common on schedule 1. This latter finding is almost entirely explained by subjects tending to take naps the day before they started a 3-day period of night shifts. On both schedules, subjects caught up sleep on days off.

## DISCUSSION

This was a natural field study, providing real-life conditions not duplicable in the laboratory. However, the data have limitations. Several changes were made between the two schedules, including: increased number of watch standers, decreased watch durations, rotation once a week rather than every few days, more sequential days off, and a different group of watch standers. Thus, one cannot be certain which change had what effect or if different changes had opposing effects. Given the small group size, it cannot be ruled out that differences apparently related to the schedule change don't actually result from changes in subject characteristics.

On the first schedule, during the 3-day-weekend weeks, subjects were on duty for only about 26 hr total, 2 day shifts or 2 night shifts. However, on alternate weeks they worked at least 60 hr, and schedule adjustments sometimes increased this to as much as 94 hours in a single week. The second work schedule still allowed for over-60-hr weeks, but this occurred only one week in 5 rather than one week in 2, and all shifts in each week were at the same time of day, rather than switching back and forth between days and nights every few days. As with schedule 1, adjustments sometimes led to increased work loads, with one instance of 12 continuous days of work including a total of 106 hr on duty.

Previous reports would suggest that the long periods of time off in schedule 2 would increase schedule acceptance among workers (Duchon, Keran, & Smith, 1994; Ng-A. Than & Theirry, 1993). All subjects in the schedule 2 group did indicate a preference for more hours per day and more days in a row to get more sequential days off. Five of the schedule 1 subjects stated a preference for working more days in a row, but only two liked more hours per day, probably because they interpreted this to mean more hours per day than they already worked. The new schedule appears to be at most only a little more popular with watch standers. However, we might have seen a more pronounced difference if we had been able to survey the same subjects before and after the schedule change.

Subjects working schedule 2 less frequently felt that fatigue impaired their ability to do their job than those working schedule 1 and less frequently felt unsafe driving home after a weekday shift. These certainly are desirable changes, however, amounts of sleep and other measures of fatigue showed no improvement on the new schedule. The only shifts where amount of post-shift sleep falls within the commonly recommended range of 7 to 8 hours are the evening shift during the week and (curiously) the long night shifts on the weekend.



Table 2: Selected Questionnaire Responses		
Question	Schedule 1	Schedule 2
Sleep After:      9-hr Day Eve Night 13-hr Day Night		right amount
		right amount
		could use a bit more
		right amount / a bit more
		a bit more / a lot more
Tired During:    9-hr Day Eve Night 13-hr Day Night		sometimes
		rarely
		frequently
		rarely-sometimes
		rarely / sometimes
Impaired During: 9-hr Day Eve Night 13-hr Day Night		rarely / sometimes
		rarely / sometimes
		rarely
		rarely / sometimes
		sometimes
Unsafe Drive:    9-hr Day Eve Night 13-hr Day Eve Night		rarely / never
		rarely / never
		sometimes
		rarely / never
		sometimes
		sometimes

Table 3: Sleep Log Data - Mean (Range)			
Measure		Schedule 1	Schedule 2
Watch Length (Hours)	Week Day	12.5 (8.5 - 13.5)	9.3 (8.5 - 10.75)
	Eve		8.9 (8.5 - 10.0)
	Night	13.0 (11.5 - 15.0)	9.9 (8.75 - 12.0)
	Weekend Day	12.0 (8.5 - 13.5)	15.5 (12.0 - 17.0)
	Night	12.4 (11.5 14.0)	12.8 (12.0 - 13.5)
Sleep After (Hours)	Week Day	6.9 (5.5 - 8.5)	6.6 (4.5 - 9.0)
	Eve		7.5 (5.0 - 10.0)
	Night	5.9 (0 - 7.5)	6.5 (3.5 - 8.0)
	Weekend Day	6.9 (6.0 - 8.5)	6.5 (5.0 - 8.5)
	Night	6.7 (5.5 - 8.5)	7.0 (5.0 - 8.0)
	Off Day	8.9 (0 - 16.5)	9.7 (0-15.5)
Number Naps	Week Day	none	3
	Eve		2
	Night	1	4
	Weekend Day	none	1
	Night	1	none
	Off Day	5	1

It is surprising that decreasing work-shift length and total hours worked by increasing manning by 20% did not increase sleep. Indubitably, subjects had more time away from work which could have been used for sleep. Therefore, these findings must indicate an increase in outside activities. When working 12-13 hr shifts, most people would not consider moonlighting or much involvement in organized leisure activities. With 8-9 hr shifts they might be tempted to do so. Unfortunately, no formal data were collected on outside activities, although one subject from the schedule-1 group spontaneously noted that he did work a second job.

These data did not allow evaluation of effects of morningness/eveningness on schedule tolerance because almost all of the subjects were morning types. Previous reports suggest this may have decreased subjects' tolerance of shift work (Breithaupt, Hildebrandt, Döhre, Josche, Sieber, & Werner, 1978; Härmä, 1993; Motahashi, 1992).

In conclusion, increasing the number of watch standers from 4 to 5 and changing the weekday schedule to a 3-shift watch instead of a 2-shift watch had surprisingly little effect on the amount of sleep watch standers got and improved schedule satisfaction minimally. There is some indication that the schedule change may have improved worker performance and safety, but most measures of fatigue remained unchanged. Thus, it appears that employers cannot assure that workers will get adequate sleep by providing them adequate time off to do so.

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## APPENDIX A: QUESTIONNAIRE USED IN FIRST SURVEY

## WORK SCHEDULE QUESTIONNAIRE<sup>1</sup>

We are considering altering the current work schedule. Your input on the following questions will assist us in evaluating the work schedule and designing a schedule which best supports mission accomplishment and optimizes your time outside of work.

### GENERAL INFORMATION:

1. Name \_\_\_\_\_ 2. Age \_\_\_\_\_
3. Are you married or living with a partner? Yes \_\_\_\_\_ No \_\_\_\_\_
4. Do you have children living with you?  
Yes \_\_\_\_\_, number of children \_\_\_\_\_, ages \_\_\_\_\_  
No \_\_\_\_\_
5. How much caffeine (servings of coffee, tea, caffeinated soft drink, etc. [specify what]) do you consume per day?  
When working day shift \_\_\_\_\_  
When working night shift \_\_\_\_\_  
On days off \_\_\_\_\_
6. Are there specific times and/or days when your favorite off-work activities occur (i.e., when you most prefer to be off-duty)?  
Yes \_\_\_\_\_ Times/Days \_\_\_\_\_  
No \_\_\_\_\_
7. You may have heard of "morning" and "evening" types of people. Which ONE of these types do you consider yourself to be?  
Definitely a morning type \_\_\_\_\_  
More a morning than an evening type \_\_\_\_\_  
more an evening than a morning type \_\_\_\_\_  
definitely an evening type \_\_\_\_\_

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<sup>1</sup>Some parts of this questionnaire were taken from or adapted from the Standard Shiftwork Index, MRC/ESRC Social and Applied Psychology Unit, Department of Psychology, University of Sheffield, Sheffield, England.

SLEEP AND FATIGUE INFORMATION:

8. Considering only what makes you feel best, at what times would you go to bed \_\_\_\_\_ and get up \_\_\_\_\_ if entirely free to plan your day?

9. What is the optimal amount of sleep for you? \_\_\_\_\_ Hours

10. How do you feel about the amount of sleep you normally get between successive

	Nowhere near enough	Could do with a lot more	Could do with a bit more	Get the right amount	Get plenty
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
days off?	_____	_____	_____	_____	_____

11. How well do you normally sleep between successive

	Extre- mely badly	Quite badly	Moder- ately well	Quite well	Extre- mely well
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
days off?	_____	_____	_____	_____	_____

12. How rested do you normally feel after sleep, between successive

	Definite- ly not rested	Not very rested	Moder- ately rested	Quite rested	Extre- mely rested
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
days off?	_____	_____	_____	_____	_____

13. Do you ever wake up earlier than you intended from sleep, between successive

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
days off?	_____	_____	_____	_____	_____

14. Do you have difficulty falling asleep between successive

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
days off?	_____	_____	_____	_____	_____



15. Do you take sleeping pills to help you sleep between successive

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
days off?	_____	_____	_____	_____	_____

16. Do you use alcohol to help you sleep between successive

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
days off?	_____	_____	_____	_____	_____

17. Do you ever feel tired on

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
days off?	_____	_____	_____	_____	_____

18. Are you ever so tired that it impairs your ability to do your job?

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____

19. Are you easily awakened by noise?

Almost Never	Rarely	Some- times	Frequ- ently	Almost always
_____	_____	_____	_____	_____

20. Is your daytime sleeping situation

very dark\_\_\_\_ a little dark\_\_\_\_ light\_\_\_\_

21. Is your daytime sleeping situation

very noisy\_\_\_\_ a little noisy\_\_\_\_ quiet\_\_\_\_

22. Do you "nod-off" while listening to/watching a boring program?

Almost never    Rarely    Sometimes    Frequently    Almost always

\_\_\_\_\_

WORK INFORMATION:

22. How long have you worked your present job \_\_\_ years, \_\_\_ months.

23. On the average, what hours are you actually on duty, including any pre-shift preparations or post-shift briefings?

	Start Work	Finish Work
on a weekday day shift	_____	_____
on a weekday night shift	_____	_____
on a weekend day shift	_____	_____
on a weekend night shift	_____	_____

24. What are the longest and shortest number of hours you have had to work?

	Longest	Shortest
on a weekday day shift	_____	_____
on a weekday night shift	_____	_____
on a weekend day shift	_____	_____
on a weekend night shift	_____	_____

25. How long does it take you to commute to and from work?

\_\_\_\_\_ minutes

26. How do you get to and from work (check all that apply)?

drive \_\_\_\_\_ ride with somebody \_\_\_\_\_ public transportation \_\_\_\_\_

27. If you drive yourself, do you ever feel unsafe when driving to or from work because of fatigue?

	<u>TO WORK</u>			<u>FROM WORK</u>		
Work Shift	Rarely/ Never	Sometimes	Often	Rarely/ Never	Sometimes	Often
days	_____	_____	_____	_____	_____	_____
nights	_____	_____	_____	_____	_____	_____

28. As compared to working 8-hour shifts, working 12-hour shifts:

fatigue is \_\_\_\_\_ is not \_\_\_\_\_ significantly more of a problem.  
 You work more efficiently \_\_\_\_\_ less efficiently \_\_\_\_\_ the same \_\_\_\_\_  
 You like it better \_\_\_\_\_ less \_\_\_\_\_ the same \_\_\_\_\_

29. If you could change the start/finish times of the 12-hour shifts from 0730 and 1930, what would you change them too? \_\_\_\_\_

30. Which do you prefer?

working more days for fewer hours per day \_\_\_\_\_  
 working fewer days for more hours per day \_\_\_\_\_

31. Which do you prefer?

Working more days in a row and having more days in a row off \_\_\_\_  
Working fewer days in a row with a day or two off in between \_\_\_\_

32. How important to you is having alternate three day weekends off, as in the current work schedule?

very important \_\_\_\_  
somewhat important \_\_\_\_  
relatively unimportant \_\_\_\_

33. Overall, how do you like your current work schedule?

very much \_\_\_\_ a little \_\_\_\_ not at all \_\_\_\_

34. Please make comments, provide any further information you feel is relevant, or discuss any changes you feel could improve the current work schedule below.

## APPENDIX B: QUESTIONNAIRE USED IN SECOND SURVEY

## WORK SCHEDULE QUESTIONNAIRE<sup>1</sup>

The work schedule used for the watch you stand was recently changed. Your input on the following questions will assist us in evaluating the work schedule and comparing it to the previous schedule.

All of your answers to these questions will be kept confidential. If any report is ever prepared from information collected with this questionnaire, you will not be identified as a participant. Filling out this questionnaire is voluntary. If you do not wish to fill out the questionnaire, or any part of it, it will not result in any penalty or prejudice against you.

### GENERAL INFORMATION:

1. Name \_\_\_\_\_ 2. Age \_\_\_\_\_
3. Are you married or living with a partner? Yes\_\_\_\_ No\_\_\_\_
4. Do you have children living with you?  
Yes \_\_\_\_, number of children\_\_\_\_, ages\_\_\_\_\_  
No \_\_\_\_\_
5. How much caffeine (servings of coffee, tea, caffeinated soft drink, etc. [specify what]) do you consume per day?

### WEEKDAYS

When working day shift \_\_\_\_\_  
When working evening shift \_\_\_\_\_  
When working night shift \_\_\_\_\_

### WEEKENDS

When working day shift \_\_\_\_\_  
When working night shift \_\_\_\_\_

DAYS OFF \_\_\_\_\_

6. Are there specific times and/or days when your favorite off-work activities occur (i.e., when you most prefer to be off-duty)?

Yes \_\_\_\_ Times/Days \_\_\_\_\_  
No \_\_\_\_

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<sup>1</sup>Some parts of this questionnaire were taken from or adapted from the Standard Shiftwork Index, MRC/ESRC Social and Applied Psychology Unit, Department of Psychology, University of Sheffield, Sheffield, England.

7. You may have heard of "morning" and "evening" types of people. Which ONE of these types do you consider yourself to be?

Definitely a morning type \_\_\_\_\_  
 More a morning than an evening type \_\_\_\_\_  
 more an evening than a morning type \_\_\_\_\_  
 definitely an evening type \_\_\_\_\_

SLEEP AND FATIGUE INFORMATION:

8. Considering only what makes you feel best, at what times would you go to bed \_\_\_\_\_ and get up \_\_\_\_\_ if entirely free to plan your day?

9. What is the optimal amount of sleep for you? \_\_\_\_\_Hours

10. How do you feel about the amount of sleep you normally get between successive

	Nowhere near enough	Could do with a lot more	Could do with a bit more	Get the right amount	Get plenty
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
DAYS OFF?	_____	_____	_____	_____	_____

11. How well do you normally sleep between successive

	Extre- mely badly	Quite badly	Moder- ately well	Quite well	Extre- mely well
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
DAYS OFF?	_____	_____	_____	_____	_____

12. How rested do you normally feel after sleep, between successive

	Definite- ly not rested	Not very rested	Moder- ately rested	Quite rested	Extre- mely rested
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
DAYS OFF?	_____	_____	_____	_____	_____

13. Do you ever wake up earlier than you intended from sleep, between successive

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
DAYS OFF?	_____	_____	_____	_____	_____

14. Do you have difficulty falling asleep between successive

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
DAYS OFF?	_____	_____	_____	_____	_____

15. Do you take sleeping pills to help you sleep between successive

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
DAYS OFF?	_____	_____	_____	_____	_____

16. Do you use alcohol to help you sleep between successive

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
DAYS OFF?	_____	_____	_____	_____	_____

17. Do you ever feel tired on

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
DAYS OFF?	_____	_____	_____	_____	_____

18. Are you ever so tired that it impairs your ability to do your job?

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
WEEKDAY					
day shifts?	_____	_____	_____	_____	_____
evening shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____
WEEKEND					
day shifts?	_____	_____	_____	_____	_____
night shifts?	_____	_____	_____	_____	_____

19. Are you easily awakened by noise?

	Almost Never	Rarely	Some- times	Frequ- ently	Almost always
	_____	_____	_____	_____	_____

20. Is your daytime sleeping situation

very dark\_\_\_ a little dark\_\_\_ light\_\_\_

21. Is your daytime sleeping situation

very noisy\_\_\_ a little noisy\_\_\_ quiet\_\_\_



22. Do you "nod-off" while listening to/watching a boring program?

Almost never      Rarely      Sometimes      Frequently      Almost always

\_\_\_\_\_

WORK INFORMATION:

22. How long have you worked your present job \_\_\_\_years, \_\_\_\_months.

23. On the average, what hours are you actually on duty, including any pre-shift preparations or post-shift briefings?

	Start Work	Finish Work
on a weekday day shift	_____	_____
on a weekday evening shift	_____	_____
on a weekday night shift	_____	_____
on a weekend day shift	_____	_____
on a weekend night shift	_____	_____

24. What are the longest and shortest number of hours you have had to work?

	Longest	Shortest
on a weekday day shift	_____	_____
on a weekday evening shift	_____	_____
on a weekday night shift	_____	_____
on a weekend day shift	_____	_____
on a weekend night shift	_____	_____

25. How long does it take you to commute to and from work?

\_\_\_\_\_ minutes

26. How do you get to and from work (check all that apply)?

drive\_\_\_\_\_ ride with somebody\_\_\_\_\_ public transportation\_\_\_\_\_

27. If you drive yourself, do you ever feel unsafe when driving to or from work because of fatigue?

Work Shift	<u>TO WORK</u>			<u>FROM WORK</u>		
	Rarely/ Never	Sometimes	Often	Rarely/ Never	Sometimes	Often
WEEKDAY						
day	_____	_____	_____	_____	_____	_____
evening	_____	_____	_____	_____	_____	_____
night	_____	_____	_____	_____	_____	_____
WEEKEND						
day	_____	_____	_____	_____	_____	_____
night	_____	_____	_____	_____	_____	_____

28. As compared to working 8-hour night shifts, working 10-hour night shifts:

fatigue is\_\_\_ is not\_\_\_ significantly more of a problem.  
You work more efficiently\_\_\_ less efficiently\_\_\_ the same\_\_\_  
You like it better\_\_\_ less\_\_\_ the same\_\_\_

29. As compared to working 8-hour night shifts, working 13-hour night shifts:

fatigue is\_\_\_ is not\_\_\_ significantly more of a problem.  
You work more efficiently\_\_\_ less efficiently\_\_\_ the same\_\_\_  
You like it better\_\_\_ less\_\_\_ the same\_\_\_

30. As compared to working 9-hr day or evening shifts, working 12-hr day shifts (If you have not previously worked 12-hour day shifts, mark N/A)

fatigue is\_\_\_ is not\_\_\_ significantly more of a problem.  
You work more efficiently\_\_\_ less efficiently\_\_\_ the same\_\_\_  
You like it better\_\_\_ less\_\_\_ the same\_\_\_  
N/A\_\_\_

31. If you could change the start/finish times of the work shifts, what would you change them too?\_\_\_\_\_

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31. Which do you prefer?

working more days for fewer hours per day\_\_\_  
working fewer days for more hours per day\_\_\_

32. Which do you prefer?

Working more days in a row and having more days in a row off\_\_\_  
Working fewer days in a row with a day or two off in between\_\_\_

33. Overall, how do you like your current work schedule?

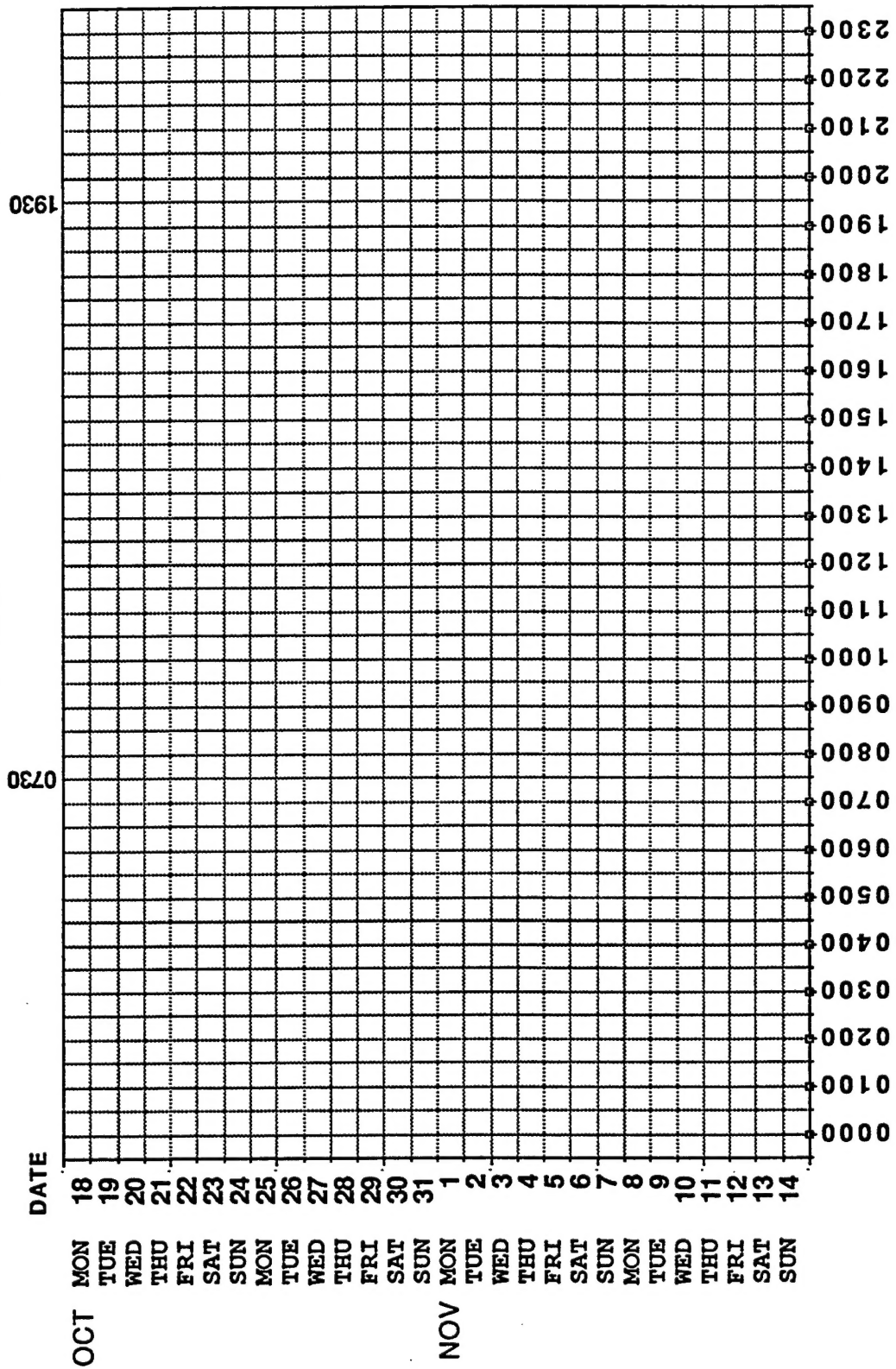
very much \_\_\_ a little \_\_\_ not at all \_\_\_

[illegible]

## APPENDIX C: SLEEP LOG

# SLEEP LOG

NAME \_\_\_\_\_



TIME

SHADE IN PERIODS WHERE YOU SLEEP (TO NEAREST HALF HOUR)  
DRAW A LINE THROUGH PERIODS WHERE YOU WORK

# REPORT DOCUMENTATION PAGE

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13. ABSTRACT (Maximum 200 words) Many types of shift-work schedules have been devised to achieve the around-the-clock coverage that frequently is required in both military and civilian work environments. Ideal shift lengths and types of rotation remain controversial. Worker job satisfaction has been reported to relate to how many sequential days off their work schedule allows.

A natural experiment occurred when the watch schedule in a Navy installation was altered from 2 shifts per day, 7 days a week being covered by 4 individuals per watch location, to 3 shifts per day on weekdays and 2 on weekends, divided among 5 watchstanders. The first schedule provided 3-day weekends on alternate weeks. The second schedule provided a 2-week period with only 2 days of work, every 5 weeks. Data from seven subjects were available for the first schedule and data from 8 subjects (different subjects) from the second schedule.

Questionnaire and sleep/work log data collected before and after the schedule change showed that the increase in the number of watchstanders and/or the new schedule resulted in fewer subjects feeling that fatigue sometimes impaired their ability to do their job or made them unsafe when driving home after work. However, amounts of sleep and other measures of fatigue remained basically unchanged, and satisfaction with the schedule was only slightly improved..

Thus, increasing the amount of time watchstanders have off work, may not lead to increased sleep. Individuals may choose to devote the extra hours to outside work or recreational activities.

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